Respondents to Administrative Order on Consent for Remedial Design

PRE-DESIGN INVESTIGATION DATA SUMMARY REPORT (REVISED)

Lower Ley Creek ~~Sub-site~~Subsite

Operable Unit 25 of the Onondaga Lake Superfund Site

City of Syracuse/Town of Salina

Onondaga County, New York

October 2020 (originally submitted May 2020)

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ACRONYMS AND ABBREVIATIONS

AOC	Administrative Order on Consent
ASTM	ASTM International
cy	cubic yards
EA	EA Science and Technology
FEMA	Federal Emergency Management Agency
FIS	Flood Insurance Study
FS	Feasibility Study
GPS	global positioning system
HEC-RAS	Hydrologic Engineering Centers River Analysis System
LDF	local disposal facility
mg/kg	milligram per kilogram
NYSDEC	New York State Department of Environmental Conservation
OU	operable unit
PCB	polychlorinated biphenyl
PDI	Pre-Design Investigation
QAPP	Quality Assurance Project Plan
RCRA	Resource Conservation and Recovery Act
RD	Remedial Design
RDWP	Remediation Design Work Plan
RI	Remediation Investigation
ROD	Record of Decision
SCO	Soil Cleanup Objective
SERAS	Scientific, Engineering, and Analytical Services
SOW	Statement of Work
SPT	standard penetration testing
SVOC	semi-volatile organic compound
TCLP	toxicity characteristic leaching procedure
Thew Associates	Thew and Associates of Canton, New York
TSCA	Toxic Substances Control Act
USACE	United States Army Corps of Engineers

USEPA	United States Environmental Protection Agency
VOC	volatile organic compound
WP	Work Plan

1 INTRODUCTION

This revised Pre-Design Investigation Data Summary Report (PDI Report), prepared on behalf of the Respondents to Administrative Order on Consent (AOC) for Remedial Design (Respondents), summarizes the performance and results of sampling and data collection performed in support of the remedial design for the Lower Ley Creek ~~Sub-site (the Sub-site~~Subsite (subsite) of the Onondaga Lake Superfund Site pursuant to the United States Environmental Protection Agency (USEPA) Record of Decision dated September 2016 (ROD; USEPA 2014). The ~~Sub-site~~Subsite (Superfund Site Identification Number: NYD986913580) is located in Onondaga County, New York within the City of Syracuse and the Town of Salina (see Figure 1-1). ~~As illustrated on Figure 1-2, the Sub-site consists of the lower 2 miles of Lower Ley Creek and adjacent upland soil areas between the State Route 11 Bridge and Onondaga Lake as well as the Old Ley Creek Channel, which is a remnant of the creek located near the upstream-most portion of the Sub-site adjacent to the closed Town of Salina landfill~~The PDI Report was originally submitted to USEPA in May 2020, and USEPA comments on that document were received via email on July 28, 2020. This PDI Report has been revised to address those comments and subsequent communications with USEPA.

The activities described herein were first proposed in a Pre-Design Investigation Work Plan submitted to USEPA on August 22, 2016. The USEPA provided comments on that submittal, and a revised Pre-Design Investigation Work Plan (PDI WP) was submitted on December 16, 2016. The December 2016 PDI WP was conditionally approved by USEPA in a letter dated February 2, 2017. Sampling locations added during subsequent mobilizations were based on an August 30, 2018 conference call between Arcadis and USEPA and subsequent communications between Arcadis and USEPA:

- USEPA follow-up comments provided in a letter dated September 7, 2018
- Additional information provided by Arcadis to USEPA in a letter dated October 19, 2018
- USEPA conditional approval provided November 9, 2018.

1.1 Site Background and History

1.1.1 ~~Sub-site~~Subsite Description

The ~~Sub-site~~Subsite is designated as Operable Unit (OU) 25 of the Onondaga Lake Superfund Site, which was listed on the National Priorities List on December 16, 1994. The ~~Sub-site~~Subsite is located within the urbanized area of eastern Syracuse, New York (see Figure 1-2). The ~~Sub-site~~Subsite consists of the lower 2 miles of ~~Lower~~ Ley Creek between the State Route 11 Bridge and Onondaga Lake. The ~~Sub-site~~Subsite also includes a 3.7-acre wetland situated on the southern bank of the creek adjacent to the closed Cooper Crouse-Hinds North Landfill and the Old Ley Creek Channel, which was an original section of the Creek before Ley Creek was widened and reconfigured during a flood control project in the 1970s. In addition, the ~~Sub-site~~Subsite includes several sections along the banks of the creek where dredged sediments were placed during the flood control project.

The ~~Sub-site~~Subsite is located within an area zoned as an Industrial District. It is bordered by parking lots, the closed Town of Salina landfill (previously remediated) and the closed Cooper Crouse-Hinds North landfill (previously remediated), other historically landfilled areas, manufacturing operations, several undeveloped properties, and a railroad line. The footprints of the former landfills are illustrated on Figure 1-2 and in the appropriate view of Figures 2-1. An underground natural gas pipeline owned by National Grid and an underground oil pipeline owned by Buckeye Pipeline Company run parallel to the northern bank of the creek for much of ~~this section.~~the section bordered by the former City of Syracuse Landfill Area and the Crouse Hinds Landfill (see Figure 1-2).

~~Lower~~ Ley Creek passes under bridges along State Route 11, 7th North Street, and Interstate 81. Bear Trap Creek enters ~~Lower~~ Ley Creek upstream of 7th North Street. The ~~Lower~~ Ley Creek channel is well defined, and the banks of ~~Lower~~ Ley Creek are near vertical in many areas. The bottom of the stream is dominated by soft sediment with some areas of stone or other hard surfaces. Much of the stream is shallow, but water may be as much as 14 feet deep in certain sections during high water events, particularly downstream of the 7th North Street Bridge. In general, ~~Lower~~ Ley Creek is narrower and shallower upstream of the 7th North Street Bridge, and wider and deeper downstream of the 7th North Street Bridge. The immediate banks of the stream are bordered predominantly by herbaceous vegetation. Some woody shrubs are also mixed in with herbaceous vegetation, and sections of the bank are wooded. Beyond the narrow strip of vegetation, ~~Lower~~ Ley Creek is surrounded by industrial operations, parking lots, landfills, and railroad tracks. The Creek transverses the northern Syracuse metro area, a heavily urbanized environment.

Two drainage swales of interest are within or adjacent to the Subsite, including a former "swale area" in the upstream portion of the site near Old Ley Creek and the former City of Syracuse Landfill Area and the "Western Drainage Swale" is a small north/south drainage ditch located north of Ley Creek and due west of the closed Town of Salina Landfill (see Figure 1-2). The former "swale area" located near Old Ley Creek was investigated in 2010 to a depth of five feet, and results indicate polychlorinated biphenyl (PCB) concentrations as high as 500 milligram per kilogram (mg/kg) in this area (USEPA 2014). In 2010 excavation was performed by the Town of Salina within the Western Drainage Swale as part of remediation activities associated with the closed Town of Salina landfill (CHA 2013).

1.1.2 Subsite History

A summary of the history of the ~~Sub-Site~~Subsite was provided in Section 2.2 of the PDI WP (Arcadis 2016).

As illustrated on Figures 2-1a and 2-1b there are certain locations north of Ley Creek within the footprint of the closed Town of Salina Landfill or adjacent to the Landfill (i.e., TP-46, TP-8, TP-45, SW/SED-22, and L-7). These locations weren't identified in the ROD as within areas identified for removal, presumably because they are not part of the Lower Ley Creek Subsite, have been previously remediated, and/or are considered as part of the closed and remediated Town of Salina Landfill Site. Summary of Previous Investigations and Usable Data

1.2 Summary of Previous Investigations and Data Usability

As presented in the PDI WP, several previous investigations have been completed to collect samples and characterize ~~Sub-site~~Subsite conditions. This section summarizes previous investigation activities, results, and data adopted for use moving forward. A complete description of the historical investigation and the historical data to be incorporated in the design of the remedy is provided in the PDI WP (Arcadis 2016).

1.2.1 Previous Investigations

In 1986, the New York State Department of Environmental Conservation (NYSDEC) and the Onondaga County Department of Health collected soil samples adjacent to the north bank of Ley Creek along the closed Town of Salina Landfill and surface water samples from the same stretch of Ley Creek and drainage ditches north and east of the landfill in 1986. In 1987, NUS Corporation collected soil samples from the main fill area north of Ley Creek, and surface water and sediment samples from Ley Creek. In 1997 and previous investigations, NYSDEC performed limited sampling in both the former channel sediments and subsurface soils. In 1998, Ley Creek channel sediments were sampled as part of the closed Town of Salina Landfill Remedial Investigation (RI)/Feasibility Study (FS).

In 2010, the NYSDEC tasked EA Engineering, P.C., and its affiliate EA Science and Technology (EA), to perform an RI and FS at the Old Ley Creek Channel Site (EA 2010) located west of the intersection of Factory Avenue and State Route 11 in the Town of Salina, Onondaga County, New York. That field effort included the collection of groundwater, surface water, floodplain soil, and sediment samples from the Old Ley Creek Channel Site.

During the most recent RI at Lower Ley Creek in 2012, fish tissue samples, surface water samples, soil samples, and sediment samples were collected and analyzed to characterize the nature and extent of contamination (Scientific, Engineering, and Analytical Services [SERAS] 2012).

1.2.2 Data Usability

For consistency with the data used throughout the RI/FS process, the following data for the ~~Sub-site~~Subsite have been adopted for use moving forward:

- Soil and sediment data collected by USEPA in 2009, 2010, and 2011
- Soil and sediment data collected by NYSDEC in 2010.

These data were further screened for design purposes using a geographical filter to include only samples collected from ~~Lower~~ Ley Creek and its adjacent floodplain between Interstate 81 and State Route 11 because no remediation is required outside of this reach.

Additional data evaluated but not carried forward for design purposes due to concerns about temporal relevance and location accuracy concerns included:

- Soil and sediment data collected by NYSDEC in 1996/1997
- Soil, waste, and sediment data collected by the Town of Salina in 1998
- Sediment data collected by other parties in 1992.

Soil and sediment data evaluated and their status determination for use in the PDI and design activities are summarized in Table 1-2 below.

Table 1-2: Summary of Data Usability Determination

Matrix	Program	Locations (n)	Samples (n)
Sediment	2009 USEPA	28	94

Matrix	Program	Locations (n)	Samples (n)
Sediment	2010 NYSDEC	8	15
Sediment	2010 USEPA	14	62
Sediment	2011 USEPA	3	23
Sediment	**Total**	**53**	**194**
Soil	2009 USEPA	5	17
Soil	2010 NYSDEC	56	161
Soil	2010 USEPA	19	57
Soil	2011 USEPA	53	164
Soil	**Total**	**133**	**399**

In total, 194 sediment samples from 53 locations and 399 soil samples from 133 locations that included PCB data were retained to assist in the PDI and design activities moving forward.

1.3 Description of the Selected Remedy

The selected remedy for the ~~Sub-site~~Subsite, as presented in the USEPA ROD, is primarily based on the presence of PCBs in Ley Creek sediments at concentrations that exceed 1 mg/kg and floodplain soils where PCB soil concentrations exceed 1 mg/kg in the upper 2 feet and/or 10 mg/kg below 2 feet. The remedy involves excavating:

- Impacted sediment from ~~Lower~~ Ley Creek between the Route 11 Bridge and I-81 as well as from the Old Ley Creek Channel
- Impacted soils associated with prior flood events and deposition of dredge spoils in the floodplains and the Old Ley Creek Channel area.

The selected remedy for Lower Ley Creek described in the ROD included the following components:

- Excavation of impacted soils located on the northern and southern banks of ~~Lower~~ Ley Creek and excavation of impacted sediment from ~~Lower~~ Ley Creek and adjacent wetland areas
- Capping soils that cannot be safely excavated due to existing oil and natural gas pipelines that run along the north bank of ~~Lower~~ Ley Creek
- Capping sediments under the Route 11 bridge (if necessary) in order to protect the structural integrity of the bridge
- Capping sediments that cannot be safely excavated due to the existing gas pipeline that crosses ~~Lower~~ Ley Creek
- Transporting excavated soils and sediments containing PCB concentrations greater than 50 mg/kg to a Toxic Substances Control Act- (TSCA-) compliant facility
- Transporting any excavated soils and sediments that fail toxicity characteristic leaching procedure (TCLP) testing, are determined to be characteristic hazardous waste, and are non-TSCA waste (i.e.,

PCB concentrations less than 50 mg/kg) to an off-site Resource Conservation and Recovery Act- (RCRA-) compliant facility

- Transporting excavated soils and sediments that are not TSCA-regulated (i.e., PCB concentrations less than 50 mg/kg) and are not characteristic hazardous waste to a local disposal facility (LDF), if available/feasible[1]
- Restoring excavated areas with clean substrate and vegetation consistent with an approved habitat restoration plan to be developed as part of the remedial design
- Developing a Site Management Plan (SMP) that will provide for the proper management of all post-construction remedy components
- Implementing institutional controls in the form of an environmental easement/restrictive covenant to restrict intrusive activities in areas where contamination remains (including areas where municipal refuse was disposed of) unless the activities are in accordance with a USEPA-approved SMP.

1.4 Report Organization

Before the remedy described in the ROD can be implemented, and in accordance with the AOC and the associated Statement of Work (SOW) entered into by USEPA and the Respondents effective July 18, 2016 (Index No. 02-2016-2014), the investigation activities described herein were performed to improve the definition of potential soil and sediment removal areas and identify any challenges to the implementation of the selected remedy. This PDI Report summarizes the performance and results of the investigations proposed in the PDI WP, introduces preliminary ~~revised~~refined removal areas, and proposes a schedule for the development of forthcoming remediation design documents. The remainder of this PDI Report is organized as follows.

- Section 2 summarizes the performance and results of the approved PDI activities.
- Section 3 summarizes the preliminary ~~revised~~refined removal areas.
- Section 4 presents the anticipated schedule for remediation design activities.
- Section 5 provides a list of references cited in this PDI Report.

[1] Local disposal facility options currently under consideration include consolidation under the cap of the closed Town of Salina Landfill within the area controlled by the leachate collection system or in a newly constructed cell with a liner and leachate collection system on the recently capped Cooper Crouse-Hinds North Landfill (which was properly closed under the State Superfund program). The specific local disposal location will be determined during the remedial design phase. Should local disposal options be determined not to be viable, these materials will be sent to an appropriate nonlocal facility for disposal.

2 PRE-DESIGN INVESTIGATION RESULTS

~~2.1 Pre-Design Investigation Summary~~

The PDI activities summarized in this report were performed to support the design of the selected remedy for the ~~Sub-site~~Subsite. As part of the PDI, data were collected from areas within and adjacent to ~~Lower~~ Ley Creek in and around the removal areas identified in the ROD to achieve the following objectives:

- Gather information about properties in the vicinity of ~~Lower~~ Ley Creek to evaluate the potential for using such properties for access and material handling/staging to support the remediation activities.
- Obtain additional characterization data for soil and sediment in the areas identified for remediation in the ROD to determine the boundaries and depths for remediation, using PCBs as the indicator compound for other contaminants.
- Obtain additional data for the soil and sediment targeted for remediation to identify appropriate waste characterization and disposal requirements.
- Determine the geotechnical properties of the soil and sediment in areas identified for remediation in the ROD to support bank and structural stability evaluation and excavated material dewatering/stabilization design.
- Gather information on saturated soil conditions and elevations in deep excavation areas to evaluate potential for slope failure and support the excavation design.
- Obtain survey data to identify ground surface and ~~Lower~~ Ley Creek bed elevations to support the remedial design and hydrologic modeling.
- Compile available information associated with bridges, pipelines, and other structures in the vicinity of the areas targeted for remediation.
- Gather terrestrial and aquatic habitat information to support the development of a habitat restoration plan as part of the design.
- Collect material to support future treatability/processing testing.

The field investigations and sample collection described herein were performed in accordance with the Field Sampling Plan, which documented the standard operations and field practices that were employed during the performance of field investigations; a Quality Assurance Project Plan (QAPP) which outline the laboratory analytical procedures and standards that were used for collected field samples; and a Health and Safety Plan that detailed the health and safety principles and protocols that were followed in the performance of the field activities described herein; all of which were submitted to USEPA as part of the approved PDI WP.

~~2.2~~2.1 Access Agreements

Before initiating the field investigation, best efforts were made pursuant to Section XI of the AOC to obtain written consent for access from the owners of all parcels needed to perform the PDI activities described herein. A complete list of the property owners for which access agreements were needed is included in the PDI WP.

Initially, access agreements were obtained from all Respondent property owners. A letter and access agreement form were mailed to each of the non-Respondent owners, and follow-up attempts were made to contact (via telephone) any property owners that did not respond to the initial mailing.

With one exception, all Respondent and non-Respondent parcel owners agreed to provide access to their properties for the performance of field activities. Despite best efforts, Solvents and Petroleum Services (the owner of Parcels 073.-01-05.0 and 073.-01-06.0, which are located to the south of and adjacent to Old Ley Creek channel) refused to provide access for sample collection. However, after consultation with USEPA, two sample locations (SED-L-001 and SED-KL-002) were moved slightly to the north to be removed from the Solvents and Petroleum Services parcels, and in turn, Solvents and Petroleum Services agreed to provide access for equipment and personnel provided no sample materials were collected from their property.

~~2.3~~2.2 Field Reconnaissance

Before PDI sample collection, field reconnaissance was performed by observing the remediation areas identified in the ROD and the areas in which PDI activities were performed. Field reconnaissance was performed to identify site features including, but not limited to, structures; utilities; and stream and ground features such as riffles, depositional areas (e.g., sand bars, gravel bars), evidence of bank undercutting or scour, potential wetlands, and other topographic depressions within the floodplain that would have impeded the performance of field investigation and sample collection. Arcadis performed the field reconnaissance in May 2017 by walking the entire length of the ~~Sub-site~~Subsite on either side of the ~~Lower~~ Ley Creek channel.

The information gathered during field reconnaissance was used to determine how best to access and sequence the PDI areas for sample collection. Although there were some areas of debris in the channel noted, and multiple areas of rubble and/or rubbish noted in the uplands areas, there were no significant modifications to the PDI scope needed based on the results of the field reconnaissance. Passage through the upland areas was difficult to achieve due to dead snags and significant overgrowth of brush and phragmites, which posed some concern for being able to access certain sample locations. However, access to the creek channel was identified at both the upstream end adjacent to the Route 11 Bridge, and the downstream end through a commercial parking lot off of 7th North Street. Further, because of the dense overgrowth, access to downstream soil investigation areas was re-planned to use existing dirt roads and utility access ways off the southern end of East Terminal Road.

~~2.4~~2.3 Infrastructure, Topographic, Bathymetric, and Sediment Thickness Surveys

An infrastructure and utility survey was completed to provide design-related information associated with the potential implementation of the removal program (e.g., access to potential removal areas near structures) and associated field data collection needs (e.g., measurements of clearances). Under this task, the locations and dimensions of structures within and adjacent to the ~~Sub-site~~Subsite were documented. In addition, bathymetric surveys of the channel and topographic surveys of the adjacent floodplain were performed to establish a comprehensive base map (including topographic/bathymetric contours) and to characterize the existing physical conditions and elevations of the channel bottom and banks. Additionally, sediment probing was performed to document approximate existing sediment thicknesses in the ~~Lower~~ Ley Creek channel. This section summarizes the performance and results of the field survey. Compiled mapping of utilities, infrastructure, landforms, and the results of the topographic and bathymetric survey are included in Appendix A. Also included in Appendix A are illustrations of the results of sediment thickness probing.

~~2.4.1~~2.3.1 Review of Available Engineering Records

Before the initiation of field survey work, existing information regarding the physical characteristics of the infrastructure and utilities in the area of the ~~Sub-site~~Subsite were reviewed from multiple resources such as the New York State Department of Transportation records, the Onondaga Country Department of Public Works and Permitting Department records, and the active utility companies in the area (e.g., National Grid, Buckeye Pipeline). Where available, as-built drawings were reviewed to familiarize the field team with the location and design of the infrastructure and utilities, including both surface and subsurface components. The field team was provided with information related to the presence and type of potential buildings, roads, and utilities, and locations were field-verified as part of the infrastructure survey detailed below. Although limited in availability, once the proposed ~~revised~~refined removal areas have been approved, the existing as-built drawings will be used during the forthcoming remedial design phase, along with the results of the field survey, to assess the proximity of such features to the proposed ~~revised~~refined removal areas and the potential need to offset or stabilize excavations that may affect the stability of nearby features.

~~2.4.2~~2.3.2 Infrastructure and Topographic Survey

In April of 2017, Thew and Associates of Canton, New York (Thew Associates) initiated the topographic survey. Thew Associates used aerial photogrammetry to obtain topographic information along the upland sections of the pre-determined transects illustrated in the PDI WP. Colored aerial photography was obtained along a band 3,000 feet wide and centered (1,500 feet on either side) on the ~~Lower~~ Ley Creek channel. The aerial photography provided flexibility to prepare comprehensive topographic mapping of the flood plain, extract additional topographic transects, and detail critical spatial and planimetric features at a much greater density than conventional topographic survey. Once the data were reduced, the aerial photogrammetry was used to prepare a comprehensive topographic survey with contours at 2-foot intervals based on a 100-by-100-foot data grid.

Following performance of the aerial photogrammetry survey, additional field work was performed with conventional survey techniques to confirm the data acquired in the aerial survey and provide spot-shot elevations and dimensions to augment the aerial survey data. In particular, conventional topographic survey techniques were employed to improve data resolution at the edge of the ~~Lower~~ Ley Creek channel and provide a better dataset to connect the upland topographic contours and the bathymetric survey data (further discussed below). Finally, in advance of soil sample collection, Thew Associates deployed ground-penetrating radar to locate utilities believed to be in the vicinity of specified sample collection locations and clear those locations for sample collection.

An illustration of the compiled topographic/bathymetric survey data and contours, along with the utility and other infrastructure, is provided in Appendix A.

~~2.4.3~~2.3.3 Bathymetric and Sediment Thickness Surveys

Bathymetric survey and sediment thickness probing were performed in the ~~Lower~~ Ley Creek channel in May of 2017. These data, together with topographic survey data described above, were obtained to document current surface sediment conditions and support development of bathymetric (i.e., top of sediment) elevations for removal design, as well as support the development of a hydraulic model of the current channel conditions (see Section 2.9). The remainder of this section presents the results of the bathymetric survey and sediment thickness probing.

~~2.4.3.1~~2.3.3.1 Bathymetric Survey

Thew Associates deployed a 16-foot shallow draft survey vessel using an echo sounder coupled with Hypack's HYSWEEP navigation and hydrographic data collection software. Survey lines for multi-beam data collection were run simultaneously, parallel with the creek channel, at spacing sufficient to obtain complete coverage of the creek bed to a water depth of approximately 2 feet. Specifically, downstream of the 7th North Street Bridge, where water depths are generally greater than upstream, Thew Associates collected data coverage of the entire creek bottom using a Norbit iWBMS multi-beam echo sounder along transects spaced at intervals sufficient to obtain 200 percent overlap from shore to shore. Upstream of the 7th North Street Bridge, Thew Associates collected continuous creek bottom profiles using a Reson Navisound 215 dual-frequency single-beam echo sounder along transects spaced at 25-foot intervals perpendicular to the shoreline, where water depths exceed 4 feet. As discussed above, conventional topographic survey methods were deployed to supplement the data collected in shallow water areas near the bank and to fill any gaps between the bathymetric survey limits and the aerial photogrammetry topographic survey of the adjacent uplands.

The compiled bathymetric data were used to create a bathymetric surface that was joined with the upland topographic elevations for a composite surface encompassing the entire ~~Sub-site.~~ subsite. An illustration of the compiled topographic/bathymetric survey data and contours, along with the utility and other infrastructure, is provided in Appendix A.

The PDI WP also included the potential for collection of side-scan sonar and sub-bottom profile information during the hydrographic survey. However, insufficient water depths and field conditions during May 2017 made the deployment of the necessary equipment infeasible, and these surveys were not completed. Should the need arise during the remedial design phase for additional data related to these activities (e.g., material profiles, sub-surface debris), the Respondents may revisit this portion of the investigation in order to supplement existing information.

~~2.4.3.2~~2.3.3.2 Sediment Thickness Probing

Concurrent with the topographic survey described above, sediment probing was performed to evaluate sediment thickness. Sediments were probed at 10- to 15-foot intervals along each of the 32 transects proposed in the PDI WP. At each probing location, a calibrated aluminum rod was pushed using manual force into the sediment until refusal. Refusal was defined as the point at which the rod can no longer be advanced by manually pushing. The location of each probe was recorded using real-time kinematic global positioning system (GPS) surveying techniques. At each probed location, Thew Associates recorded the elevation of the sediment surface, the elevation at which refusal was met, and a qualitative description of apparent sediment type and related field observations. Recorded data associated with the sediment probing are summarized in Appendix A.

Of the 158 sediment thickness locations probed, recorded measurements ranged from 0 feet (suggesting the presence of surface debris) to a maximum of 8.6 feet. The average sediment thickness based on the recorded values was approximately 3.4 feet, with more than 130 of the records suggesting more than 1 foot of accumulated sediment. Cross sections illustrating the recorded values, along with the approximate locations of each of the 32 transects, are included in Appendix A.

~~2.5~~2.4 Soil and Sediment Chemical Characterization

The PDI sampling program was developed to refine the vertical and horizontal extent of PCB impacts in areas in and around the ROD-defined removal areas. Primarily, PDI soil and sediment samples were analyzed for PCBs, with select samples also submitted for analysis of metals. Note that, in the PDI WP, the removal areas defined in the ROD were categorized as either soil or sediment removal areas and given alphabetic titles (e.g., SOIL-D, SED-J) running sequentially upstream from the downstream portion of the ~~Sub-site~~Subsite, starting with SOIL-A and SED-A near the I-81 bridge over the ~~Lower~~ Ley Creek channel. Hereafter, investigation activities are referenced with respect to the locations of the soil and sediment removal areas, all of which are illustrated on Figures 2-1a through 2-1j.

The soil sampling program was developed such that, based on the results of the investigations described in the PDI WP (Arcadis 2016), the Respondents could propose supplemental investigations and soil sample collection (either inboard or outboard as suggested by the results of the PDI) to confirm the potential expansion and/or contraction of the ROD-defined removal extents. As such, PDI soil and sediment samples were collected over four separate mobilizations to facilitate an iterative approach to characterizing the extent of potential PCB impacts and refining the removal areas and depths, as follows:

- June 5 through July 19, 2017
- May 1 through 11, 2018
- January 4 through 18, 2019
- September 16 to 23, 2019.

This section describes the field sampling conducted as part of the PDI field activities. Soil sampling, including the number of samples collected and a summary of analytical results, is summarized in Tables 2-1 and 2-2. Sediment sampling, including the number of samples collected and a summary of analytical results, is summarized in Tables 2-3 and 2-4. Sample collection locations for both soils and sediments are illustrated on Figures 2-1a through 2-1j. A complete record of sample-specific analytical results for both soils and sediments is included in Appendix B; and the associated data validation reporting is included in Appendix C.

The PDI sampling programs followed the procedures set forth in the EPA approved PDI WP (Arcadis 2016), and as stated therein, the analytical procedures for the analysis of soil and sediment samples were consistent with USEPA-approved procedures. Specifically, samples collected for PCB analysis were analyzed for Aroclor-specific PCBs using USEPA Method 8082, with a detection limit of 0.05 mg/kg for all Aroclors, and samples subject to metals analysis were analyzed using USEPA Method 6010C/7470A.

Quality control (QC) samples (i.e., matrix spike/matrix spike duplicates, field duplicates, trip blanks, and field blanks) were collected at the frequency specified in the PDI WP (Arcadis 2016) for each sample matrix collected, including one field duplicate per 10 samples collected and one matrix spike/matrix spike duplicate per 20 samples collected. All soil and sediment sample results were validated in accordance with the procedures outlined in the PDI WP (Arcadis 2016).

The remainder of this section summarizes the means and methods of sample collection, number of samples collected, analyses performed, and the sample results.

~~2.5.1~~2.4.1 Soil Sampling Program and Results

Soil samples were collected from the upstream end of the ~~Sub-site~~Subsite adjacent to State Route 11 to the downstream extent of SOIL-B for chemical characterization to improve the delineation associated with the ROD-defined removal areas. Additionally, some PDI soil sampling was performed along the National Grid and Buckeye Pipeline Company pipelines to determine the limits of material that can be safely removed along the pipelines. Further, at USEPA request, additional samples were collected along the CSX railroad bed adjacent to the SED-A and SED-B investigation areas to determine whether removal should be expanded to include the narrow area between the railroad corridor and the channel across the creek from the ROD-defined removal areas.

Soil borings were installed by hand or with a tractor-mounted boring rig to location-specific depths based on the removal depths identified in the ROD, with individual samples collected from respective borings in 1-foot increments. Based on the removal depths identified in the ROD, selected samples were initially sent for PCB analysis, while others were held for PCB and/or metals analysis contingent upon the analytical results of the overlying samples. ~~Table 2-1 summarizes the PDI soil sampling program. The~~Data was reviewed as it was made available by the laboratory, and samples at deeper depths were released if the initial results were greater than the cleanup goal. However, if PCB levels observed in the 1- to 2-foot intervals were greater than 1 mg/kg but less than 10 mg/kg (the standard applicable to subsurface soils greater than 2 feet) the vertical extent was considered delineated at 2 feet and additional analysis was not necessary.

As part of an iterative approach and in an attempt to reduce mobilizations, parent and step-out samples were collected together, with parent samples initially sent for analysis while the step-out samples (i.e., those samples with "STEP" as part of the ID) were held for PCB analysis contingent upon the analytical results of the parent sample. In locations where the parent sample exceeded the cleanup goal, the STEP sample(s) were released for analysis to further delineate the removal area. Additionally, during a subsequent mobilization, a sampling program was performed to delineate areas with PCB results greater than 50 mg/kg (such samples have IDs with "T"). Since the vertical depth of PCBs had already been characterized in these areas the, evaluation of vertical extent of contamination was not an objective at these T samples and the samples were obtained to evaluate the lateral extent PCB results greater that 50 mg/kg.

The general goals of the soil sampling program include:

- In most soil removal areas (SOIL-B, -C, -D, -E, -H, -I [including a deeper sub-areas within SOIL-I], -L [including seven deeper sub-areas within SOIL-L], and -M), borings were generally installed at strategic locations along the perimeter of the areas to sample for PCBs and evaluate the ROD-defined removal limits and/or depths.

- For certain soil removal areas where ROD-defined removal was driven by metals exceedances (SOIL-F, -G), borings were not proposed in the PDI WP (Arcadis 2016) nor were they initiated during the first mobilization. However, during subsequent mobilizations, borings were installed and samples submitted for PCB analysis to confirm the ROD-defined removal limits of SOIL-F.
- For two of the deeper sub-areas within SOIL-L, (SOIL-L7 and -L8), additional samples were collected for potential metals analysis based on the results of the PCB analysis.
- Soil borings along the National Grid and Buckeye pipelines were installed approximately every 100 feet on either side of the pipeline in soil removal areas Soil-B, -C, and –D and analyzed for PCBs to determine if soil removal in the vicinity of the pipeline is required, confirm the removal in those areas described in the ROD, and characterize materials in the top 2 feet that may be left in place as a soil cover if it is determined that removal of deeper materials in this area is impractical or cannot be completed safely or without jeopardy to the integrity of the pipeline.
- Characterization of the narrow strip of land between the CSX railroad corridor and the ~~Lower~~ Ley Creek channel on the south or southeast side of the creek near the regional transit hub.

A summary of the soil sampling program is presented in Table 2-1 below.

Table 2-1: Summary of Soil Sampling Program

Mobilization	Number of Locations	Number of Samples for PCBs Analysis[2]
June 5 through July 19, 2017	72	193
May 1 through 11, 2018	57	126
January 4 through 18, 2019	87	183
September 16 to 23, 2019	37	67
Total	**353**	**569**

Notes:
1. In addition, per the PDI WP, because SOIL-L7-001 (8- to 12-foot intervals) returned PCB results less than 10 mg/kg these four intervals were released for metals analysis. All analytes were below the soil cleanup objectives (SCOs) for metals except two arsenic results at a depth of 10 feet (as noted in Section 3.1, SOIL-L7 is proposed as a 10-foot removal).
2. Number of samples does not include QC samples.

A summary of the soil sample analytical results is presented in Table 2-2 below.

Table 2-2: Summary of Soil Sample PCB Results by Area

Soil Investigation Area	Number of Samples Analyzed	Range of PCB Concentrations (mg/kg)	Mean PCB Concentration (mg/kg)	Median PCB Concentration (mg/kg)
SOIL-B	32	0.031 to 8.1	1.3	0.69
SOIL-C	94	ND to 11	1.1	0.43
SOIL-D	100	ND to 67	5.5	1.3
SOIL-E	62	ND to 130	14	2.6
SOIL-F	6	ND to 0.20	0.10	0.11
SOIL-H	57	0.0076 to 94	4.1	0.36
SOIL-I	104	ND to 580	36	1.1
SOIL-I1	11	ND to 67	4.1	0.011
SOIL-L	22	0.0071 to 150	13	1.7
SOIL-L3	4	ND	ND	ND
SOIL-L4	12	0.046 to 160	14	0.40
SOIL-L5	12	ND to 310	33	0.10
SOIL-L6	2	5.1 to 8.3	6.7	6.7
SOIL-L7	12	ND to 5.0	0.67	0.017
SOIL-L8	3	0.16 to 12	3.7	0.42
SOIL-L9	3	0.024 to 20	9.8	9.4
SOIL-M	8	0.022 to 1.2	0.37	0.13
SOIL-RAIL	25	ND to 6.3	1.3	0.90
All	**569**	**ND to 580**	**12**	**0.75**

Notes:
1. Before calculating statistics, duplicate and parent sample results were averaged, and non-detect (ND) values are represented by half the quantitation limit. Statistics are rounded to two significant figures.

As can be seen in the above table, PCB analytical results were highly variable ranging from non-detect to 580 mg/kg with the highest results in SOIL-I and SOIL-L in the vicinity of the Old Ley Creek Channel, all of which are targeted for removal. Despite these few areas of high concentrations, the majority of the results were relatively lower and nearer to or below the PCB performance standard. This can be seen in a comparison of the mean and median results for each soil area where, with one exception, the median result is considerably lower than the mean, suggesting that the mean values are heavily influenced by the presence of a few extreme results.

The complete results from the soil sampling program, including results from metals analysis, are presented in Appendix B, and the corresponding locations are illustrated on Figures 2-1a through 2-1j. Analytical results from the soil samples were compared to the PCB cleanup goal and/or the SCO for metals as defined in the ROD and were used to make proposed changes to the ROD-defined removal depths and extents. Section 3 presents a description of the ~~revised~~refined soil removal areas and associated depths.

~~2.5.2~~2.4.2 Sediment Sampling Program and Results

Sediment samples were collected from the State Route 11 Bridge to just upstream of SED-A near the I-81 Bridge for chemical characterization. Sediment samples were collected with barge-mounted vibracore equipment to location-specific depths based on the removal depths identified in the ROD, with individual samples collected from respective borings in 1-foot increments. Similar to the soil sampling program, some samples were initially sent for analysis, while others were held for PCB and/or metals analysis contingent upon the analytical results of the overlying samples. Table 2-3 summarizes the PDI sediment sampling program, and Table 2-4 summarizes analytical results. Sediment sample locations are illustrated on Figures 2-1a through 2-1j. The goals of the sediment sampling program include:

- In areas with anticipated sediment removal depths of 2 feet (i.e., SED-B, -D, -H, -I, -K, and –L), single cores were collected at the approximate mid-channel point in areas where existing data are limited. In removal areas where the ROD specifies removal depths of 5 feet or greater (i.e., SED-E, -F, -G, and -J), sediment samples were collected to refine areas where removal depths are driven by a single sample representing relatively long stretches of the ~~Lower~~ Ley Creek channel. In most instances, where appropriate based on the channel width, samples were collected at three locations across the channel (i.e., mid channel and the left and right approximate toe of slope).
- In “gaps” between removal areas (i.e., between removal areas SED-A and –B, SED-E and –F, SED-H and –I, and SED-K and –L), where removal is not required by the ROD, cores were collected at the approximate mid-channel location to confirm that PCB concentrations in sediments are below the cleanup goal.
- Where existing PCB data were equal to or greater than 50 mg/kg, sediment samples were collected to further delineate TSCA wastes.
- In removal areas SED-F and –L, where PDI samples indicate PCB concentrations below 1 mg/kg, the samples were also run for analysis of other constituents for which cleanup goals are listed in the ROD to evaluate whether removal is needed based on these other constituents. In this fashion, PCB serves as the indicator compound, but levels of other constituents (i.e., metals) were tested to determine if adjustment of the ROD removal limits was appropriate.

A summary of the sediment sampling program is presented in Table 2-3 below.

Table 2-3: Summary of Sediment Sampling Program

Mobilization	Number of Locations	Number of Samples for PCBs Analysis[2]
June 5 through July 19, 2017	84	364
May 1 through 11, 2018[1]	8	13
Total	**88**	**377**

Notes:
1. Four cores collected in May 2018 were at duplicate locations from the 2017 mobilization (i.e., SED-J-006C, -006L, -004C, -004R); however, samples were collected from deeper depths in 2018. As such, the total Number of Locations is not additive of the efforts from 2017 and 2018.
2. In addition, six samples were submitted for metals analysis: SED-F-001C (2-3), SED-F-001L (2-3), SED-F-002L (2-3), SED-F-002R (3-4), SED-F-004 (4-5), and SED-L-004 (2-3)
3. Number of samples does not include QC samples.

A summary of the sediment sample analytical results is presented in Table 2-4 below.

Table 2-4: Summary of Sediment Sample PCB Results by Area

Sediment Investigation Area	Number of Samples Analyzed	Range of PCB Concentrations (mg/kg)	Mean PCB Concentration (mg/kg)	Median PCB Concentration (mg/kg)
SED-AB	10	ND to 0.16	0.049	0.042
SED-B	4	ND to 0.81	0.25	0.085
SED-D	4	0.053 to 29	7.6	0.64
SED-E	30	ND to 17	1.9	0.32
SED-EF	9	ND to 1.2	0.227	0.024
SED-F	42	ND to 60	5.6	2.0
SED-G	129	ND to 130	15	9.1
SED-H	10	0.052 to 150	32	11
SED-HI	7	ND to 20	3.7	1.2
SED-I	2	0.044 to 0.26	0.15	0.15
SED-J	100	ND to 350	36	5.7
SED-K	4	ND to 13	3.8	1.1
SED-KL	6	0.0062 to 34	9.7	4.1
SED-L	20	ND to 320	24	5.5

Sediment Investigation Area	Number of Samples Analyzed	Range of PCB Concentrations (mg/kg)	Mean PCB Concentration (mg/kg)	Median PCB Concentration (mg/kg)
All	**377**	**ND to 350**	**18**	**2.8**

Notes:
1. All PCB results are presented in mg/kg. Before calculating statistics, duplicate and parent sample results were averaged, and ND values are represented by half the quantitation limit.

As can be seen in the above table, PCB analytical results were highly variable ranging from non-detect to 350 mg/kg with the highest results in SED-J and SED-L in the vicinity of the Old Ley Creek Channel. Similar to the soil sample analytical results discussed above, these higher results were relatively limited and a comparison of the mean and median results for each sediment area indicates the median result is considerably lower than the mean, suggesting that the mean values are heavily influenced by the presence of a few extreme results.

The complete analytical results from the sediment sampling program are presented in Appendix B, and the corresponding locations are illustrated on Figures 2-1a through 2-1j. Analytical results from all of the sediment samples were compared to the PCB cleanup goal in sediment as defined in the ROD. Section 3 describes the ~~revised~~refined sediment removal areas and depths.

~~2.6~~2.5 Waste Characterization

During soil and sediment sampling, waste characterization samples were also collected to determine or support the selection of appropriate disposal facilities. Waste characterization samples represent a composite of the multiple depth intervals at each of the waste characterization locations. The sample ID for the waste characterization samples indicates the corresponding SOIL or SED location from which the depth intervals were composited.

Composite sediment and/or soil samples were collected from among the remediation areas identified in the ROD. Each composite sample was composed of a minimum of three aliquots collected from soil and sediment borings and spatially distributed within each targeted area. The waste characterization soil and sediment samples were collected in conjunction with the soil and sediment sampling described above, with waste characterization materials collected from the same borings/cores. Figures 2-1a through 2-1j illustrate the waste characterization sampling locations.

In total, composite samples were collected from 12 upland soil locations and nine sediment locations. The composite waste characterization samples were submitted for laboratory analysis for the following TCLP parameters: volatile organic compounds (VOCs); semi-volatile organic compounds (SVOCs); metals; pesticides and herbicides; as well as ignitability, reactivity, and corrosivity. Of the soil and sediment waste characterization samples analyzed, only one sediment location exhibited any detectable SVOCs (SED-E), and only one soil sample exhibited detectable VOCs (SOIL-C). Similarly, of all the waste characterization samples analyzed, only two sediment locations (SED-G and -J) exhibited any detectable concentrations of pesticides/herbicides. Metals ~~detections~~ were detected in the majority of samples, with the most frequent detections being barium, chromium, cadmium, and lead. All TCLP concentrations detected were well below the applicable TCLP hazardous waste standards. A complete summary of the waste characterization data for both soil and sediment samples is provided in Appendix B.

In addition to the waste characterization parameters discussed above, PCB data collected from the soil and sediment sampling locations described above will be used during the remedial design phase to determine appropriate waste characterization requirements. PCB results suggest that there will be some TSCA-regulated waste to be transported off site for disposal. However, the TCLP results discussed above, as well as similar results discussed in Section 3 associated with the performance of treatability studies, indicate that the vast majority of materials targeted for excavation will be classified as non-hazardous. These wastes will be managed in an ~~on-site~~existing LDF ~~constructed~~(i.e., the closed Town of Salina Landfill or closed Cooper Crouse-Hinds North Landfill) or will be sent to an appropriate nonlocal facility for ~~the Lower Ley Creek excavation materials~~disposal.

~~2.7~~2.6 Geotechnical Borings

As part of the remedial design process, the areas of deeper excavation and dredging will require additional considerations regarding bank stability and potential excavation shoring design and analysis. In-water and upland geotechnical borings were installed in areas of anticipated excavation/dredging, specifically in deeper areas, adjacent to existing infrastructure, and in areas where potential shoreline stabilization may be required during dredging. Specific geotechnical borings were installed near the bridge abutments of State Route 11 and 7th North Street to evaluate potential stability concerns around the bridge foundation that may arise during dredging operations. A geotechnical investigation was initiated on May 22, 2017 and concluded on June 9, 2017. The completed investigation included five in-water locations (one of which [GT-002] was installed from shore) and 13 upland locations. The locations of the installed geotechnical borings are illustrated on Figures ~~2a~~D-1a through ~~2k~~D-1g (Appendix D).

In-water geotechnical borings were installed using a barge-mounted drill rig. Drilled borehole methods were used, whereby steel casing was seated into the sediment for water quality considerations and for drilling rod stability through the water column. Upland soil borings were installed using a track or all-terrain vehicle rig to maneuver around any upland obstacles and trees. Upland soil borings were installed using hollow-stem auger drilling methods. A GPS hand-held unit was used to document 11 boring locations during implementation; the remaining 7 locations were moved in the field during implementation but due to equipment malfunction, their relocations were documented by hand in the field notes. The locations of certain borings were moved slightly in the field based on observations made during site reconnaissance or obstacles encountered during field activities, and as a result, there are some differences in locations relative to the proposed locations illustrated in the PDI WP. Additionally, boring GT-016 proposed in the PDI WP was removed from the program once field activities commenced. Table 2-5 below summarizes the performance of the boring installation program.

Table 2-5: Summary of Boring Installation Program

Location	Investigation Date	Category	Target Investigation Depth	Depth Achieved
GT-019	6/1/2017	Upland	45	0-45.3
GT-018	6/1/2017	Upland	25	0-24
GT-017	6/2/2017	Upland	45	0-45
GT-015	5/31/2017	Upland	45	0-46.3
GT-014	5/31/2017	Upland	45	0-45.3

Location	Investigation Date	Category	Target Investigation Depth	Depth Achieved
GT-013	5/22/2017	In-water	25	0-16
	5/23/2017			16-20.4
GT-012	6/6/2017	Upland	25	0-30
GT-011	6/6/2017	Upland	15	0-11.3
GT-010	6/5/2017	Upland	25	0-30
GT-009	5/23/2017	In-water	25	0-18
	5/24/2017			18-24
GT-008	6/7/2017	Upland	15	0-16
GT-007	5/24/2017	In-water	25	0-26
GT-006*	6/7/2017	Upland	15	0-30
GT-005	5/24/2017	In-water	25	0-20
GT-004*	6/8/2017	Upland	15	0-16
GT-003	6/8/2017	Upland	15	0-30
GT-002**	6/8/2017	In-water	25	0-30
GT-001	6/9/2017	Upland	15	0-30

*moved target location across creek for easier access
**moved target location to shoreline

Sampling for the geotechnical borings included the following:

- Standard Penetration Testing: SPT was performed continuously throughout the soil column to boring termination in accordance with ASTM D1586.
- Shelby Tube Sampling: Approximately nine Shelby tubes were collected at an approximate frequency of one tube for every three borings where fine-grained soils where encountered. Shelby tube sampling was performed in accordance with ASTM D1587.

Upon completion of the sampling, select split-spoon sample intervals and Shelby tube samples were selected for the following laboratory analyses.

- Grain-size analysis in accordance with ASTM D422
- Moisture content in accordance with ASTM D2216
- Atterberg limits in accordance with ASTM D4318
- Specific gravity in accordance with ASTM D584.

The results of the geotechnical analyses noted above, including the depth intervals for which individual samples were collected, are summarized in Appendix D. Boring logs for each of the respective boring locations, including a description of material types, blow counts, and other field data/observations, are also included in Appendix D.

~~2.8~~2.7 Habitat Characterization

Habitat characterization was performed in support of future remedial design activities and habitat restoration planning. Field activities included visual reconnaissance to document the habitat characteristics of the ~~Lower~~ Ley Creek and bank habitats in and adjacent to the areas where remedial activities designated in the ROD were planned. Observations were focused on three primary areas: wildlife habitat, aquatic habitat, and the banks of the ~~Lower~~ Ley Creek.

On May 30, 2018, Arcadis scientists performed qualitative aquatic habitat and semi-quantitative bank characterizations within targeted remediation areas to support both creek channel and bank restoration design. Habitat characterizations were performed consistent with the PDI WP within the main stem of the ~~Lower~~ Ley Creek area from the Route 11 Bridge crossing at the upstream end of the remediation area to the Park Street Bridge (just south of the Route 81 Bridge crossing) at the downstream end of the remediation area, as well as the Old Ley Creek channel from the confluence of Ley Creek up to the property line towards Route 11 to the east.

Aquatic habitat characterization was performed to qualitatively assess presence and absence field conditions for fish habitat and provide general habitat type characteristics (e.g., inorganic substrate composition, large woody debris, embeddedness) to detail existing habitat conditions for use in the future remedial design phase. In addition, any significant physical habitats (e.g., scour pools or functional boulders) within the existing channel that may provide variations in flow and/or refuge for fish were marked in the field notes, located, and logged with a Trimble GPS unit.

Bank areas within and adjacent to potential removal areas were characterized based on their slope, vegetation, aquatic habitat components, and stability. The bank characterization effort consisted of field observations and measurements to describe the existing banks in terms of height, slope, material composition, vegetative cover, and stability. As part of the future remediation design phase, this information will be used to identify bank areas that are currently stable and should be restored to a similar condition, as well as banks that are not currently stable and may, therefore, require a different remediation approach and/or bank restoration application to create a more stable bank during bank restoration.

A complete description of the aquatic habitat characterization activities and the related results, including stream channel habitat mapping, a summary of bank assessment data, and representative photographs, is provided in Appendix E.

~~2.9~~2.8 Wetland Delineation and Upland Characterization

Existing data and a review of publicly available National Wetland Inventory and New York State Freshwater Wetland Maps indicate that wetlands are present in portions of the floodplain areas along ~~Lower~~ Ley Creek within and adjacent to locations where remediation will be implemented. Due to historical modifications and disturbances of the upland area within the ~~Sub-site~~Subsite, there appears to be only limited remaining terrestrial habitat of high value. Nevertheless, in May and June of 2018, terrestrial and wetland habitats in the areas where remedial activities are planned were characterized to support the habitat restoration design to be performed in the future remedial design phase.

Wetland delineations were performed within and in the vicinity of areas where remedial activities were defined in the ROD. The boundaries of identified wetlands were delineated in the field, and the vegetation of each wetland was characterized to support resource impact quantification, project permitting, and restoration design. Wetland boundaries were delineated based on observed characteristics of existing ~~Sub-site~~subsite vegetation, hydrology, and soils consistent with the methods described in the PDI WP.

Subsequently, flagging was placed in the field based on vegetation identification to mark wetland boundaries for surveying and mapping.

A meander survey was performed to identify the vegetative communities of each wetland and identified upland habitat type and observations of soil and hydrologic conditions influencing vegetative communities recorded. Density, diameter, and species of trees and shrubs in forested wetlands were characterized using data collected from sampling plots of approximately 900 square feet established in representative areas of the wetland at a density of three plots per acre.

In most instances, wetland boundaries were generally coincident with or similar to the remedial areas identified in the ROD. There are some locations where there may be additional wetlands identified due to changing removal boundaries, and these additional areas, however limited, will be addressed as part of the remedial design phase. A complete description of the wetland and upland habitat characterization activities, including field observations and a list of identified wetland types, is included in Appendix F. Appendix F also includes copies of appropriate portions of state and federal wetland maps, topographic maps, and soil survey maps; a photographic log of the identified wetlands; completed field data forms; and a site plan presenting the surveyed wetland boundaries, all of which will be used in the forthcoming remedial design phase.

~~2.10~~2.9 Hydrodynamic Modeling

To assess the hydraulic impacts of future potential remediation designs, a hydraulic model of the existing channel conditions is necessary based on Federal Emergency Management Agency (FEMA) requirements. Following the completion of the bathymetric and topographic surveys discussed above, an existing conditions hydraulic model was developed with U.S. Army Corps of Engineers (USACE's) Hydrologic Engineering Center's River Analysis System (HEC-RAS) software for a steady-state, one-dimensional condition. This is a typical modeling approach consistent with FEMA and USACE requirements and recommendations. The model, which allows for the simulation of hydraulic velocities and water surface elevations relative to a subject flow, will be used to evaluate potential flow and flood conditions for the ~~Lower~~ Ley Creek during and after construction to allow for assessment of remedial design options.

Drainage areas and flowrates were based on the November 4, 2016 FEMA Flood Insurance Study (FIS) for Onondaga County, NY (All Jurisdictions). The FIS provides detailed descriptions of past flood evaluations of Ley Creek including flowrates and Manning "n" roughness coefficients. After review there were significant differences identified between FIS assumptions and current creek conditions. For example, the existing FIS includes a "railroad bridge" just north of the Interstate 81 overpass that caused significant localized water surface increases of approximately 2 feet in the FIS. However, recent field survey and aerial imagery have confirmed that this structure no longer exists. As such, a duplicate existing conditions model was developed with the same modeling parameters (e.g., Manning "n" values, flowrates) as the previous FIS where possible, but engineering judgment was required to modify parameters that were no longer applicable (see Appendix G).

Water surface elevations predicted by the model were generally lower than flood elevations indicated in the FIS. This is largely due to the removal of site conditions that are no longer applicable, such as the railroad bridge described herein, that were included in the FIS estimates. This new existing conditions model, based on recent bathymetry and current site conditions will be used during the remedial design phase to assess the impacts of the proposed remedial design once the final remedy has been determined. Results of the hydraulic modeling performed are included in Appendix G.

~~2.11~~2.10 Treatability Study Results

As discussed above, the remedy set forth in the ROD included an evaluation of the disposal of select excavated materials at an LDF. Excavated materials will very likely require processing, treatment, and/or conditioning to allow for hauling to and placement in the landfill. Additionally, decant water associated with the processing of saturated materials (e.g., supernatant, stormwater that comes in contact with excavation spoils) may require treatment to improve suspended material settling conditions before water treatment and discharge. Specifically, the treatability study assessed the solidification and stabilization of removed sediments in preparation for disposal and the settling/separation of materials suspended in decant water. The treatability study was performed by Arcadis at its USEPA-approved treatability laboratory in Durham, North Carolina. A complete description of the performance of the treatability study activities and associated results is included in Appendix H.

A desktop review was performed to review and evaluate potential methods for the dewatering of dredged sediments. The review included evaluation of basic methods (e.g., passive stockpiling and gravity drainage), mechanical (e.g., size separation [desanding], filter press), geotextile tube applications, as well as the addition of agents (polymers) to enhance dewatering and material stabilization. Based on the initial desktop review, passive dewatering with the addition of Portland cement reagent was evaluated in the physical/analytical treatability tests on the ~~Lower~~ Ley Creek sediment samples. Passive dewatering was selected based on the ease of application and the ability to mix dredged sediments with excavated upland soils rather than import more sophisticated equipment. Arcadis focused on the need to improve handling characteristics of the sediment to be removed from ~~Lower~~ Ley Creek. Application of Portland cement was selected because it chemically binds water as the cement cures and because of the resultant strength development that would be necessary for placement in the LDF. Additionally, jar tests were performed on smaller samples of saturated materials to assess the potential need for flocculation or enhanced dewatering techniques in preparation for water treatment.

The results of the treatability study suggest that passive dewatering, particularly in light of the ability to mix excavated sediments with similarly excavated upland soils, is sufficiently able to provide for primary dewatering and preparation for material stabilization. Even without the benefit of adding drier upland soils, Portland cement additive ratios were identified on a removal area-specific basis with resultant materials able to pass paint filter testing and meet proposed materials strength goals for placement in the LDF. Additionally, materials settling behavior observed in jar tests and the results of pre- and post- stabilization waste characterization analyses suggest that there is not likely any need for enhanced dewatering or materials separation techniques (e.g., flocculant addition) before water treatment.

3 DESCRIPTION OF ~~REVISED~~REFINED REMEDY

The primary goal of the PDI activities discussed herein was to acquire field information and data to be incorporated in the remedial design phase. Field data, such as the presence of wetlands or unique habitats, bank stability, and flow in the ~~Lower~~ Ley Creek channel, will all be used to develop remediation approaches that optimize required material removal while minimizing disturbance to the existing environment. Details of the proposed remediation approach and the proposed final remediation areas will be presented in a Remedial Design Work Plan (RDWP), which will be prepared following EPA review and approval of this PDI Report.

This PDI Data Summary Report proposes ~~changes to~~refinement of the removal areas identified in the ROD using PCBs as an indicator compound, and illustrates new removal limits where:

- PCB concentrations in sediment exceed 1 mg/kg
- PCB soil concentrations exceed 1 mg/kg in the upper 2 feet and/or 10 mg/kg below 2 feet.

The new removal limits described in this section are based on the incorporation of existing data, the original removal limits described in the ROD, and the new soil and sediment data described herein, and account for removal of known PCB concentrations within the Subsite with PCB concentrations greater than the PCB cleanup goal. A summary of the PDI data used to determine the modifications below is included in Appendix B. Proposed ~~revised~~refined removal limits and depths are illustrated on Figures 2-1a through 2-1j and summarized below. The need for post-excavation sampling for areas where removal limits are not fully defined by a sample location with PCB results less than the criteria listed above will be addressed in the Remedial Design (RD).

3.1 ~~Revised~~Refined Soil Remediation Area

With some exceptions, soil samples were collected for PCB analysis from around the perimeter of the ROD-identified removal areas, or within the interiors of larger removal areas with lower sample densities. Over several mobilizations, sampling was performed iteratively to refine the existing removal boundaries/depths and either expand or reduce the boundaries/depths based on sample locations and a comparison of the analytical results and applicable standards.

Specific locations were selected in several removal areas to confirm deep removal depths that were based on previous or historical investigations and/or to better delineate the horizontal extent of certain removals. The following is a summary of specific changes made to the soil removal limits ~~based on targeted sample collection activities other than delineation samples~~:

- SOIL-A (Figures 2-1i through 2-1j) – Historical PCB sample results indicate this area should be considered for a proposed removal extent reduction area based on the following conclusions:
  - The area is adjacent to and within the City of Syracuse landfill area (see purple shading on Figures 2-1i and 2-1j for the landfill area), and although the remedy addresses PCBs found in dredge spoils/flood residue that had been deposited on top of landfilled waste, the remedy does need to address PCBs (or other constituents) contained in landfilled waste;

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  - The historical metals results are generally below the screening criteria, with the exception of arsenic, copper, lead, mercury, and zinc, which are not substantially above the screening criteria (see Appendix I);
  - Boring logs from LLCD01 and LLCD02 specify presence of anthropogenic material such as asphalt, concrete, and brick generally indicative of landfill waste / construction demolition debris which should not be considered as part of the Lower Ley Creek Subsite (see Appendix I); and
  - The location of SOIL-A is fairly isolated and separated from the remainder of the removal areas, and the negative impacts from additional disturbance required to remediate outweighs the benefit of removing the soil.
- SOIL-B (Figures 2-1h through 2-1i) – Based on delineation samples, the removal area was expanded upstream and downstream from the original ROD-defined removal area. Additionally, multiple sample locations returned results less than the SCO, resulting in a portion a reduction to the ROD-defied removal area. Topography was used, along with analytical results, to define the limits of the SOIL-B removal area (including to define the limits of the proposed removal extent reduction area associated with SOIL-B).
- SOIL-C (Figures 2-1f through 2-1h) – Based on delineation samples, the removal area was expanded slightly downstream from the original ROD-defined removal area and in a slightly wider corridor adjacent to Ley Creek downstream from the 7th North Street bridge (see Figure 2-1g). Topography was used, along with analytical results, to define the limits of the SOIL-C removal area parallel to Ley Creek. Additionally, PCB sample results east and west of historical sample LLCD13 indicate a proposed removal extent reduction area around LLCD13 based on the following conclusions (see Figure 2-1h):
  - The area is solidly within the former City of Syracuse landfill area (see purple shading on Figure 2-1h for the landfill area), and although the remedy addresses PCBs found in dredge spoils/flood residue that had been deposited on top of landfilled waste, the remedy does need to address PCBs (or other constituents) contained in landfilled waste;
  - PDI soil sampling results provide supporting information that this area is not part of a former dredge spoil/flood residue area – specifically samples SOIL-C-032 and SOIL-C-038 through -042 are less than 1 mg/kg for PCBs and indicate this area is not part of the dredge spoil/flood residue deposit and the boundary as presented in the ROD should not have been extended to encompass LLCD13;
  - The historical metals results are generally below the screening criteria, with the exception of copper, lead, mercury, nickel, and zinc, which are not substantially above the screening criteria (see Appendix I);
  - Boring logs from LLCD13 and LLCD14 as well as field notes from SOIL-C-037 through -042 specify presence of anthropogenic material such as asphalt, concrete, plastic, brick, and glass generally indicative of landfill waste / construction demolition debris which should not be considered as part of the Lower Ley Creek Subsite (see Appendix I); and
  - The location of LLCD13 is fairly isolated and separated from the remainder of the removal areas, and the negative impacts from additional disturbance required to remediate outweighs the benefit of removing the soil.

- SOIL-D and -D1 (Figures 2-1c through 2-1f) – Based on delineation samples, the removal area was generally expanded outward from Ley Creek. Topography was used, along with analytical results, to define the limits of the SOIL-D removal area parallel to Ley Creek. The greatest expansion in removal area and depth is in the area east of the closed and remediated Town of Salina landfill (see Figure 2-1d). Additionally, in this area, as discussed in Section 1.1.1, a prior excavation was performed by the Town of Salina within the Western Drainage Swale that crosses through the eastern end of SOIL-D. Because this area has already been remediated, the removal extent of SOIL-D does not include the Western Drainage Swale and this area will not be included in the excavation addressed by the forthcoming remedial design.[2]
- SOIL-E (Figures 2-1d through 2-1f) – Based on delineation samples, the removal area was generally expanded downstream and up to 7th North Street. Topography was used, along with analytical results, to refine the expansion of SOIL-E to the northeast. Additionally, a portion of SOIL-E was remediated as part of the closed Cooper Crouse-Hinds landfill. As a result, a section of SOIL-E has been proposed as a removal extent reduction area and removed from the proposed remedy.
- SOIL-F (Figure 2-1d) – Samples in this area were collected to confirm removal limits associated with historical sample LLCD34. Upon further review, it was determined that sample LLCD34 is actually located in an area that has been remediated as part of the closed Cooper Crouse-Hinds landfill. Specifically, LLCD34 is located on the property line of the closed Cooper Crouse-Hinds landfill and within the footprint of a drainage swale constructed during prior remediation. Additionally, there were no exceedances associated with samples collected as part of this PDI effort. As a result, SOIL-F has been removed from the proposed remedy.
- SOIL-H (Figures 2-1 through 2-1d) – Based on delineation samples, the removal area was expanded both upstream and downstream from the ROD-defined removal extent. Topography was used, along with analytical results, to define the limits of SOIL-H.
- SOIL-I, -I1, -I2, and -I3 (Figures 2-1a through 2-1c) – Based on delineation samples, the removal area was expanded, generally to the east. Additionally, samples collected in the interior of SOIL-I did not exceed the SCOs and a portion of SOIL-I is proposed as a removal extent reduction area. Topography was used, along with analytical results, to define the limits of the SOIL-I, -I1, -I2, and -I3 removal areas (including to define the limits of the proposed removal extent reduction area associated with SOIL-I).
- SOIL-J (Figure 2-1a) – Upon further review, it was determined that historical samples SS-20/SB-20 are actually located in an area that has been addressed as part of remedial activities associated with the closed Town of Salina landfill (see green shading on Figure 2-1a for the area previously remediated). As a result, SOIL-J has been removed from the proposed remedy.
- SOIL-J1 (Figure 2-1a) – Upon further review, it was determined that historical samples SS-17/SB-17, SS-18/SB-18, and L-108 that exceed the SCOs are not located in an area that has been addressed as part of remedial activities associated with the closed Town of Salina landfill (see green shading on

[2] An 8-foot removal area, SOIL-D1, was presented in the 2013 Feasibility Study, seemingly associated with sample location LLCD25 (see Figures 2-1d through 2-1f); however, LLCD25 does not exceed the SCO below a depth of 2 feet and it is unclear why an 8-foot removal depth was previously proposed. As a result, the ROD-defined removal extent of SOIL-D1 was absorbed into the 2-foot SOIL-D removal extent.

Figure 2-1a for the area previously remediated). As a result, SOIL-J1 has been added to the proposed remedy to address these historical samples.

- SOIL-L (Figure 2-1a) – Samples collected from around the perimeter of this area indicated that the required removal should be expanded to the north, ending at the intersection with the ~~Lower~~ Ley Creek channel. Note that a portion of SOIL-L~~, as well as previous soil removal areas SOIL-L1 and SOIL-L2, were~~ was removed from the proposed remedy, as it was determined that soil at ~~those~~the associated historical sample locations (i.e., SS-03) had already been addressed as part of remedial activities associated with the closed Town of Salina landfill~~.~~ (see green shading on Figure 2-1a for the area previously remediated). Additionally, remedial activities associated with the closed Town of Salina Landfill addressed some historical sample locations that exceed the SCO but were not identified in the ROD for remediation (i.e., SS-19/SB-19, L-107, L-110), and as such these locations are not added to the proposed remedy.

- SOIL-L1 and -L2 (Figure 2-1a) – Upon further review, it was determined that sample historical samples associated with SOIL-L1 and SOIL-L2 (i.e., SS-04/SB-04, SS-09/SB-09,) had already been addressed as part of remedial activities associated with the closed Town of Salina landfill (see green shading on Figure 2-1a for the area previously remediated). As a result, SOIL-L1 and SOIL-L2 have been removed from the proposed remedy.

- SOIL-L3 (Figure 2-1a) – Samples collected at or in the vicinity of sample location SS-14/SB-14 did not confirm previously reported exceedances at depth. This area has been reduced from an 8-foot to a 2-foot removal depth similar to the remainder of SOIL-L.

- SOIL-L6 (Figure 2-1a) – Samples collected at or in the vicinity of sample location SS-11/SB-11 did not confirm previously reported exceedances at depth. This area has been reduced from an 8-foot to a 2-foot removal depth similar to the remainder of SOIL-L.

- SOIL-L7 (Figure 2-1a) – Samples collected did not support removal to 14 feet, previously associated with sample location SS-12/SB-12/MW-02. Samples at new location SOIL-L7-001 were collected from the 2- to 3-foot increment to the 13- to 14-foot increment for analysis of PCBs with additional 1-foot samples collected to 16 feet and held for analysis. Associated results suggest that removal depth in this specific area can be limited to 10 feet.

- SOIL-L8 (Figure 2-1a) – Samples collected did not support removal to 14 feet, previously associated with sample location SS-05/SB-05. Samples in this area were collected from the 2- to 3-foot increment to the 0- to 8-foot increment for analysis of PCBs with additional 1-foot samples collected to 16 feet and held for analysis. Associated results suggest that removal depths in this specific area can be limited to 4 feet, and the northeast border can be refined based on SOIL-L8-002.

- SOIL-L9 (Figure 2-1a) – Samples collected did not support removal to 14 feet ~~from this boring, previously associated with sample location SB-05B~~.[3] Samples at new locations SOIL-L8-001 and SOIL-L9-001 were collected from the 2- to 3-foot increment to the 13- to 14-foot increment for analysis of PCBs with additional 1-foot samples collected to 16 feet and held for analysis. Associated results suggest that removal depth in this specific area can be limited to 3 feet.

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[3] ROD-defined removal area was seemingly associated with sample location SB-05B; however, SB-05B does not exceed the SCO. It is unclear why a 14-foot removal depth was presented in the ROD.

- SOIL-M (Figure 2-1c) – The initial sample collected to delineate historical sample LLCD38 exceeded the SCOs; however, additional samples collected in this area did not exceed the SCOs and support a reduction in the ROD-defined removal extent for SOIL-M.
- As noted above, USEPA requested specific sampling in the area between the CSX railroad corridor and the ~~Lower~~ Ley Creek channel. Analytical results associated with these specific locations suggest that newly identified removal should be performed to a depth of 2 feet in removal areas SOIL-R1, -R2, ~~and -R3.~~ -R3, and -R4 (Figures 2-1h through 2-1j).

~~In addition, in 2010 excavation was performed by the Town of Salina within the Western Drainage Swale as part of remediation activities associated with the closed Town of Salina landfill (CHA, 2013). The Wester Drainage Swale is a small north/south drainage ditch that crosses SOIL-D in the eastern end of SOIL-D just to the west of the closed Town of Salina landfill. The approximate location of the Western Drainage Swale excavation is illustrated on Figure 2e. Because this area has already been remediated, the Western Drainage Swale has been removed from SOIL-D and will not be included in the excavation addressed by the forthcoming remedial design.~~

Based on the refined soil removal extents and depths, the soil removal volume has increased from approximately 82,700 cubic yards (cy) of material to approximately 94,400 cy of material. Figures 2-1a through 2-1i include an illustration of the proposed refined removal extents and depths. Table 3-1 summarizes the changes in the proposed removal areas and volumes between the ROD and the estimated removal extent based on the results of the PDI activities described herein.

In addition, certain of the samples discussed above were collected with a particular focus on improving the delineation of materials that may need off-site disposal in accordance with TSCA regulations (i.e., the "T" samples). As a result of the sample collection activities described herein, it is estimated that approximately 8,100 cy of soils have PCB concentrations greater than 50 mg/kg and will be transported to an appropriately regulated TSCA-approved facility. Soil sample locations with analytical results from any depth interval that exceeded 50 mg/kg are illustrated on Figures 2-1a through 2-1j.

3.2 ~~Revised~~Refined Sediment Remediation Area

In all instances, sediment samples were collected to verify the spatial extent of ROD-defined removal limits, verify the size of deep removal areas with limited historical samples, and confirm the conclusions made in areas where historical sampling locations were sparse.

Specific locations were selected in several removal areas to confirm deep removal depths that were based on previous or historical investigations and/or to better delineate the horizontal extent of certain removals. The following is a summary of specific changes made to the sediment removal limits:

- SED-D (Figure 2-1g) – Samples collected support increasing the removal depth to 3 feet, with a small area (SED-D1) targeting a 4-foot removal.
- SED-E, -E1, -E2, -E3, -E4, and -E5 (Figures 2-1f through 2-1g) – Samples collected did not support a removal depth of 5 feet in most locations, and instead proposed removal depths range from 2 feet to 5 feet.

- SED-EF (Figures 2-1e through 2-1f) – Delineation samples were collected between SED-E and SED-F in an area not previously identified for remediation. Results exceeded the cleanup criteria and as such a 2-foot removal is proposed between SED-E and SED-F.
- SED-F, -F1, -F2, -F3, -F4, -F5, -F6, -F7, -F8, and -F9 (Figures 2-1d through 2-1f) – Samples collected either did not support a removal depth of 4 feet or support increasing the removal depth. The proposed removal depths range from 2 feet to 7 feet.
- SED-G, -G1, -G2, -G3, -G4, -G5, -G6, -G7, -G8, -G9, -G10, -G11, and -G12 (Figures 2-1c through 2-1e) – Samples collected either did not support a removal depth of 8 feet or support increasing the removal depth. The proposed removal depths range from 3 feet to 10 feet.
- SED-H, -H1, and -H2 (Figures 2-1b through 2-1c) – Samples collected support increasing the 2-foot removal depth in two areas, which are now proposed as SED-H1 (3 feet) and SED-H2 (5 feet).
- SED-HI1 and -HI2 (Figures 2-1b through 2-1c) – Delineation samples were collected between SED-H and SED-I in an area not previously identified for remediation. Results exceeded the cleanup criteria and as such a 2-foot (SED-HI2) and a 3-foot (SED-HI1) removal are proposed between SED-H and SED-I.
- SED-I, -I1, and -I2 (Figures 2-1b through 2-1c) – Samples collected support increasing the 2-foot removal depth in two areas, which are now proposed as SED-I1 (5 feet) and SED-I2 (4 feet).
- SED-J, -J1, -J2, -J3, -J4, -J5, -J6, -J7, -J8, -J9, -J10, and -J11 (Figure 2-1a) – Samples collected either did not support a removal depth of 8 feet or support increasing the removal depth. The proposed removal depths range from 2 feet to 9 feet.
- SED-K and -K1 (Figures 2-1a through 2-1c) – Samples collected support increasing the 2-foot removal depth in one area, which is now proposed as SED-K1.
- SED-KL and -KL1 (Figure 2-1a) – Delineation samples were collected between SED-K and SED-L in an area not previously identified for remediation. Results exceeded the cleanup criteria and as such a 2-foot (SED-KL1) and a 3-foot (SED-KL) removal are proposed between SED-K and SED-L.
- SED-L and -L1 (Figure 2-1a) – Samples collected support increasing the 2-foot removal depth to 5 feet (SED-L) and 8 feet (SED-L1).

Based on the refined sediment removal extents and depths, the sediment removal volume has decreased slightly from approximately 72,400 cy of material to approximately 71,500 cy of material. Figures 2-1a through 2-1j include an illustration of the proposed refined removal extents and depths. Table 3-2 summarizes the proposed changes to the ROD-defined sediment removal areas and volumes.

In addition, the collected sediment samples were assessed in an estimate of materials that may need off-site disposal in accordance with TSCA regulations. It is estimated that approximately 3,700 cy of sediments have PCB concentrations greater than 50 mg/kg and will be transported to an appropriately regulated TSCA-approved facility. Sediment sample locations with analytical results from any depth interval that exceeded 50 mg/kg are illustrated on Figures 2-1a through 2-1j.

4 SCHEDULE

The PDI work described herein, particularly the proposed modifications to the soil and sediment removal areas, will serve as the basis for the forthcoming remedial design. As described in the SOW, a RDWP will be submitted within 60 days after USEPA ~~concurrence with the Local Disposal Assessment~~approval of this PDI Report ~~which was submitted to USEPA~~. The schedule for the RDWP and subsequent RD deliverables is summarized in ~~December 2016.~~ Table 4-1.

Table 4-1: Schedule

Deliverable	Deadline
RDWP	60 days after EPA approval of this revised PDI Report
Preliminary (30%) RD	90 days after EPA approval of the RDWP
Intermediate (60%) RD	60 days after EPA comments on the 30% RD
Pre-final (95%) RD	60 days after EPA comments on the 60% RD
Final (100%) RD	60 days after EPA comments on the 95% RD

5 REFERENCES

Arcadis. 2016. Pre-Design Investigation Work Plan – Lower Ley Creek Sub-site of the Onondaga Lake Superfund Site. December.

CHA. 2013. Letter Report on Western Drainage Swale Remediation – Former Town of Salina Landfill, Salina NY. January.

EA. 2010. Final Remedial Investigation Report, Old Ley Creek Channel Site (7-34-074), Town of Salina, New York. November.

SERAS. 2012. Field Activity Summary Report, Lower Ley Creek Superfund Site, WA #SER0007 – Trip Report. January.

USEPA. 2014. Record of Decision. Lower Ley Creek Sub-site of the Onondaga Lake Superfund Site, City of Syracuse/Town of Onondaga County, New York. September.

TABLES

FIGURES

APPENDIX A

Field Sampling Plan

APPENDIX B

Quality Assurance Plan

APPENDIX C

Health and Safety Plan

APPENDIX D

Emergency Response Plan

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